Problem K. Kitchen Timer

Time limit: 2 seconds
Memory limit: 1024 megabytes

Kenny has a microwave in his kitchen. The microwave has a pretty weird one-button timer interface.

When you have put some food into the microwave and want it to start heating, you should press the button one or multiple times. When you press the button for the first time, the timer is set for 1 minute. If you immediately press the button again, 2 minutes are added to the timer, for a total of 3 minutes. If you immediately press the button yet again, 4 more minutes are added to the timer, and so on. If you press the button for the k-th time without a pause, it adds 2^k minutes to the timer.

It seems impossible to set the timer for some periods of time by using the button: for example, how to set the timer for 2 minutes? Fortunately, you can reset the button counter by making a pause for one second. So, for example, if you press the button, make a pause for one second, and then press the button again, the timer is set for 2 minutes. Another example: if you press, press, pause, press, press, press, the total time on the timer is $1 + 2 + 1 + 2 + 4 = 10$ minutes.

Kenny needs to heat his food for exactly x minutes. Help him to find the minimum number of one-second pauses he needs to set the timer. Let us assume that only pauses take time, while time to press the button is ignored.

Input

Each test contains multiple test cases. The first line contains the number of test cases t ($1 \le t \le 10^4$). The description of the test cases follows.

The only line of each test case contains a single integer x, denoting the number of minutes Kenny needs to heat the food for ($1 \le x \le 10^{18}$).

Output

For each test case, print a single integer, denoting the minimum number of one-second pauses Kenny needs to make when setting the microwave timer for x minutes.

Example

standard input	standard output
7 1 2 3 4 10 239 123456789012	0 1 0 1 1 4 19

Note

In the first example test case, no pauses are needed: Kenny can just press the button once.

In the second example test case, Kenny can press, pause, press to set the timer for 2 minutes.

In the third example test case, Kenny can just press the button twice to set the timer for 3 minutes.

In the fourth example test case, Kenny can press, press, pause, press to set the timer for $1 + 2 + 1 = 4$ minutes.